ELECTRONIC TABLET

TECHNICAL FIELD

[1] The present invention relates generally to portable electronic displays, as are commonly used to view data and images, and in particular to electronic capture and display devices which display written material and capture the movements of a stylus, pen or finger over the surface of a touch screen/display component.

BACKGROUND ART

[2] Current electronic book viewers are generally small format devices, about the size of a paperback book. For the most part, the devices either support viewing written material ("books") only in a proprietary format or are actual handheld computers with a complicated user interface. A few larger format devices exists but are expensive and have limited battery life (typically about three hours). Moreover, current devices are not particularly rugged and thus prone to damage from being dropped or subjected to moisture or liquids.

[3] Thus, there is a need for a simple to use, affordable, rugged, large format viewing device which displays information stored in standard electronic media formats and which may allow users to annotate the material they are viewing. There is also a need for a device which will allow users to "print" material to the display system from a computer or a network and then remove the device and access the material independent of any computer or network. There is also a need for a device which is capable of accessing material stored on flash ROM cards.

SUMMARY OF THE INVENTION

[4] The present invention allows a user to acquire data and images on a personal computer or purchase data and images on removable media, such as flash ROM, download the material to a portable display system and "consume" the material wherever (s)he chooses.

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[5] The present invention provides a portable, stand alone, display and capture system. The user interfaces with the device via "soft" buttons shown on the display and captured by the touch screen. Marks captured by the touch screen may also be stored as annotations associated with the content being displayed during capture.

[6] The user interface is simple and straightforward. Commands are presented in the form of icons and text on the display and the user executes these commands by touching the area of the display where the icon is shown. There is little need to enter textual data.

[7] Data and applications may be loaded onto the device via a Universal Serial Bus (USB) port, an infrared (IR) port or other wireless interface or through a FLASH ROM port (such as Smart Media, Compact FLASH or Secure Digital/Multi-Media).

[8] A collection of applications are provided which run on a personal computer to facilitate configuring the device and downloading content and applications to the device via the USB or IR port. A wireless or other data communication medium may also be employed.

[9] The internal battery may be charged by inductive charging or may be powered by being plugged directly into a wall outlet.

[10] The USB connector and the FLASH ROM sockets are secured behind a"door", which forms a water tight seal when closed.

[11] The device is housed in a shock absorbent enclosure, assembled so as to be water proof.

[12] The present invention is a portable, stand alone, display and capture system designed to be low power, light weight, inexpensive, simple to use, water proof, rugged and large format.

BRIEF DESCRIPTION OF THE DRAWINGS

[13] FIG. 1 is a front perspective view of an electronic tablet of the present invention;

[14] FIG. 2 is a front elevational view thereof;

[15] FIGs. 3A and 3B are left side and right side elevational views thereof;

[16] FIGs. 4A and 4B are top side and bottom side elevational views thereof;

[17] FIG. 5 is a back elevational view thereof with a stand in a retracted position;

[18] FIG. 6 is a back perspective view thereof with the stand in an extended position;

[19] FIG. 7 is a close up perspective of a sliding connector access door in the open position;

[20] FIG. 8 is a block diagram of the electronic tablet;

[21] Fig. 9 is an exemplary screen shot illustrating the user interface of the electronic tablet, and

[22] FIG. 10 is a close up perspective of a hinged connector access door in the open position.

DETAILED DESCRIPTION

[23] FIG. 1 is a front perspective view and FIG. 2 is an elevational view of an embodiment of an electronic tablet 100 of the present the invention. A display 2 is relatively large, such as 8.5" x 11", and may be a color LCD, active or passive matrix, Organic LED, E-Ink or any other suitable low power display. For clarity and ease of reading, the minimum resolution is preferably 1024 x 768 pixels. For user comfort and extended battery life, one or more photodetectors 18, located near the center of two adjacent sides of the enclosure 1 (or any other satisfactory location), detect ambient light conditions and adjust backlighting of the display 2 for optimum viewing. Overlaying the display 2 is a touch screen 5. The touch screen 5 may be one of several technologies which allow either finger or stylus use. The touch screen 5 and the display 2 are sealed 6 into an enclosure 1 in a water tight fashion. A waterproof, momentary contact switch 4 is recessed into an edge of the enclosure 1 and turns the unit on and off and may also serve to reset the unit. A door 3 provides a waterproof cover for connectors for USB and flash ROM ports. The exterior of the enclosure 1 is preferably fabricated from a shock absorbent, slip resistant plastic or other like material. The outer edges of the enclosure 1 may be rounded to provide the user with a comfortable experience while holding the tablet 100. When the door 3 is closed, the tablet is sealed from the outside environment and thus waterproof, preferably to a depth of about one foot.

[24] Consequently, the tablet 100 is ruggedized to prevent damage due to physical shock or liquids (such as water, coffee and other common household fluids). The

top, sides and back of the enclosure 1 are preferably constructed of pliable, shock absorbing material. A thin plastic sheeting over the display/touch screen surface may be used as protection from shock and scratches. The momentary contact switch 4 is preferably constructed with thick pliable plastic, designed to withstand tens of thousands of pushes. A battery access panel (see FIG. 5) is ridged with a plastic O-ring seal. The connector access door 3 may be of hard plastic and slides (or hinges) to the closed position to form a seal between the outside of the door and the inside of the enclosure 1.

[25] FIGs. 3A and 3B are left and right side elevational views of the electronic tablet 100. The connector access door 3 is shown in the FIG 3B in the closed position, covering the USB connector 22 and connectors for removable flash memory, such as for Compact Flash 19, Smart Media 20 and Multi-Media/Secure Digital Flash 21.

[26] FIGs. 4A and 4B are top and bottom side elevational views of the electronic tablet 100. If desired, infrared an port 23 may be located anywhere in the case 1 and is shown in Fig. 4A in the right edge of the case 1.

[27] FIG. 5 is a back elevational view of the electronic tablet 100. Access to a re-chargeable battery (not shown) is made through the access panel 14 which is secured to the enclosure 1 with fasteners 15. As previously noted, the access panel 14 is preferably fastened to the enclosure 1 in a waterproof manner. An integrated stand 9 may be included and is shown in a retracted state. When the stand 9 is retracted, tabs 10 and 12 securely hold the stand in the retracted state. It will be appreciated that other means may be used to secure the stand 9. When extended (as illustrated in FIG. 6), the stand 9 swivels out on hinge points 7 and 8. Pads 11 and 13, constructed of non-skid material, prevent the tablet 100 from slipping when set on a surface. The stand 9 may be held in the extended position by tabs (not shown) in contact with the ends of the stand 9. The maximum extension is controlled by the ends of the stand 9 contacting a stop (not shown), thus preventing further extension. A hollowed out area 16 into which the stand 9 retracts has no sharp edges. The widest area of the recessed area 16 is provided so that the user can place a finger inside the recess and swivel out the stand 9.

[28] A high frequency pick up coil 17 for the inductive charging system is shown inside the tablet 100. It is preferably situated near a corner of the device so that an auxiliary charging coil can be easily clamped over the side of the device and lay over the pick up coil 17.

[29] FIG. 7 illustrates the connector access door 3 in the open position. The door, shown sliding up, may slide down to give access to the connector. The door 3 can slide to a first detent, allowing access to the USB connector 22 only, or to a second detent, allowing access to both the USB connector 22 and the flash ROM connectors 20 and 21, or to a third detent, allowing access to the USB connector 22 and all of the flash ROM connectors 19, 20 and 21.

[30] Fig. 8 is a block diagram of an electronic tablet 100 of the present invention. A highly integrated IC 800, such as might be packaged as an ultra very large scale integrated circuit (U-VLSIC), manages all facets of the operation of the tablet 100. Examples of such an system IC include the Samsung S3C2410x and the Intel PXA26x. The system IC preferably includes: an embedded processor 802; internal memory 804; a system clock 806; a DMA controller 808; a system memory controller 810; a DRAM memory controller 812; a USB controller 814; an IR or other wireless communications controller 816; a power management controller 818; a flash memory controller 820; a general I/O controller 822; a display controller 824; a backlight controller 842; a touch screen controller 826; and a debug controller 828. It will be appreciated that other system ICs may be used and that any of the controllers integrated within the illustrated system IC 800 may instead be external.

[31] A display 2 and touch screen 5 are coupled to the system IC 800 through the display controller 824 and touch screen controller 826, respectively. The backlight (not shown) for the display 2 and the ambient light detector(s) 18 are coupled to the system IC 800 through the backlight controller 842. The rechargeable battery 830, inductive pickup coil 17 and a battery 832 for the internal clock 806 are coupled to the system IC 800 through the power management controller 818. If a DC adapter is used instead to operate and/or charge the tablet 100 through a conventional AC wall outlet, it may be coupled through the power management controller 818; such an adapter may plug into the tablet 100 through an appropriate connector situated

behind the water tight sliding door 3. The IR emitter/detector 23 is coupled to the system IC 800 through the IR controller 816. Other wireless communications devices, if used, would be coupled to the system IC 800 through appropriate controllers. The USB connector 22 is coupled to the system IC 800 through the USB controller 814. The on/off/reset switch 4 and other like switches and sensors, such as a door-open detector 834, are coupled to the system IC 800 through the GPIO controller 822. Diagnostics and debugging may be performed via a debug connector 836 coupled to the system IC 800 through the debug controller 828, Internal DRAM 838 is coupled to the system IC 800 through the DRAM controller 812. Internal flash ROM 840 as well as the connectors 19, 20 and 21 for external flash media are coupled to the system IC 800 through the flash memory controller 820.

[32] The electronic tablet 100 allows a user to acquire data and images (collectively referred to as "content") and applications on a personal computer or network or purchase data and images on removable flash media. Applications may be provided to run on a personal computing system to facilitate configuring the tablet 100 and downloading content and applications to the tablet 100. When the tablet 100 is connected to the computer, software provided with the tablet 100 and executed on the embedded processor 802 configures the computer to see the device as both a networked storage device and as a networked printer. When the tablet 100 is used as a storage device, the user of the computer can cause data to be stored in the internal memory 838 or 840 of the tablet 100. When used as a printer, a print driver installed on the computer causes the information being printed to be formatted for display on the tablet 100 and then copies the formatted data file to the tablet 100. Applications, data and images (electronic books, magazines, newspapers, text files, sheet music and "printed" files; that is, anything that can be printed to a printer) may be downloaded to the tablet 100 via the USB connector 22, or via one of the flash ROM connectors 19, 20 and 21. Appropriate hardware and software may also be employed to enable downloading applications and content via wireless infrared or radio frequency (RF) transmission or other data communication medium. The user may then "consume" the information distant from computers and computer networks. Once loaded into the internal memory 838 or 840 of the tablet 100, written material

(such as e-books) may be read, and still and video images may be viewed, wherever the user chooses, independent of the computer or network.

[33] As illustrated in Fig. 9, a user interface presents simple commands to the user, presented in a graphical fashion (such as with icons) on the display 2, allowing the user to navigate the information stored in the device and execute the applications that are present. The user interacts with the tablet 100 via "soft" buttons on the touch screen 5, using a finger or stylus to touch the area of the display 2 where an icon representing the desired command is shown. When viewing data stored on the tablet 100, the user may annotate the content by making marks with the stylus. These marks are captured and stored with the content being displayed. Captured markings may be retrieved from the device by moving the appropriate file(s) to one of the removable flash ROM devices. When connected to a computing system, the annotated data may also be uploaded to the computing system via the USB connection or other transmission means.

[34] Fig. 10 presents another method of realizing the access door 3. In this figure, the door is seen hinged to the top of the case and in the open position. The access door 3 achieves a watertight seal by compressing the O-Ring seal xx onto the inner face xx of the door 3.

[35] The device is preferably powered by the internal rechargeable battery 830. Although charging may be effected by plugging the unit into a wall outlet, charging may also be effected with the inductive charger 17, transmitting power through the case 1. A microprocessor based control system regulates the battery charging process. A small, clamp-on charging device may be provided to radiate the energy into the case 1 at a frequency of approximately 100 KHz although other inductive charging means may also be used.

[36] The objects of the invention have been fully realized through the embodiments disclosed herein. Those skilled in the art will appreciate that the various aspects of the invention may be achieved through different embodiments without departing from the essential function of the invention. The particular embodiments are

illustrative and not meant to limit the scope of the invention as set forth in the following claims.